

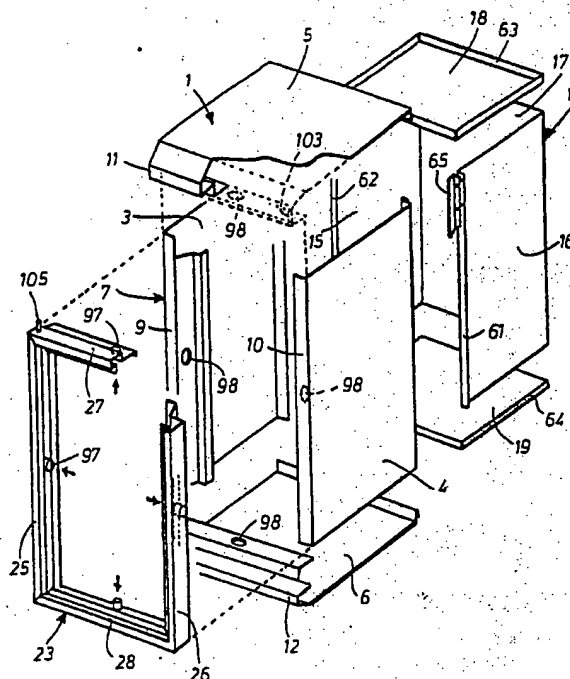


INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(21) International Application Number: PCT/SE90/00645 (22) International Filing Date: 5 October 1990 (05.10.90) (30) Priority data: 8903293-2 6 October 1989 (06.10.89) SE (71)(72) Applicant and Inventor: DAHLSTEDT, Roland [SE/SE]; Nysättersvägen 19, S-741 00 Knivsta (SE). (74) Agent: AWAPATENT AB; Box 7645, S-103 94 Stockholm (SE). (81) Designated States: AT (European patent), BE (European patent), CH (European patent), DE (European patent), DK (European patent), ES (European patent), FI, FR (European patent), GB (European patent), HU, IT (European patent), LU (European patent), NL (European patent), NO, SE (European patent), SU.		Published <i>With international search report.</i> <i>In English translation (filed in Swedish).</i>

(54) Title: FIRE PROTECTED SAFE**(57) Abstract**

A fire-resisting safe is disclosed, comprising a box-shaped safe body with a safe opening frame (7) which is formed of sections of sheet material and to which an outer and an inner body casing (1 and 13, respectively), also of sheet material, are connected. The space formed between said body casings and defined at the front by the safe opening frame (7) is filled with a fire-resisting filling. A safe door hung in the safe body has a door frame (23) which also is formed of sheet material sections and which laterally defines a door inner space also filled with a fire-resisting filling, said door frame conforming to the safe opening frame, such that, when the safe door is closed, the door frame (23) and the safe opening frame (7), all round sealingly engage one another along at least a part of the cross-section of the respective sheet material sections. The sheet material section pertaining to the respective wall members (3, 4, 5, 6) of the outer body casing (1) and forming an associated safe opening frame member (9, 10, 11, 12) is made in one piece with the wall member in question in the form of an inwardly folded sheet section member. The sheet material section pertaining to the respective door edge and forming an associated door frame member (25, 26, 27, 28) is made in one piece with an adjoining door front edge member in the form of an inwardly folded sheet section member. The fillings are dimensionally stable also when subjected to intense heat.



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FIRE PROTECTED SAFEField of the Invention

The present invention relates to a fire-resisting
5 safe comprising a box-shaped safe body with a safe opening,
said body including a safe opening frame which is
formed of sections of sheet material and to which an outer
and an inner body casing, also of sheet material, are connected,
10 the space formed between said inner and said outer
body casing and defined at the front by the safe opening
frame being filled with a fire-resisting filling; and a
safe door hung in the safe body and including a door frame
which also is formed of sheet material sections and which
15 laterally defines a door inner space also filled with a
fire-resisting filling, said door frame conforming to the
safe opening frame, such that, when the safe door is
closed, the door frame and the safe opening frame all
round sealingly engage one another along at least a part
20 of the cross-section of the respective steel material section.

Background

In conventional fire-resisting safes of the above-
mentioned type, the respective safe opening frame members,
i.e. the two side members, the top and the bottom, are
25 each formed of two sheet material sections which are
welded together, usually at a web of the section. One
sheet material section, the outer one, constitutes an
inwardly folded integrated part of the outer body casing,
and the other sheet material section, the inner one, constitutes
30 an outwardly folded integrated part of the inner
body casing. Since the locking bolt guides of the safe are
fixed to the safe opening frame (more particularly to the
inner sheet material section), the door frame must be
stable and accurate to dimensions. This means that the
35 inner body casing must be made of the same heavy sheet
material as the outer body casing, and that the sheet
material sections must be welded together in exact align-

ment and to close tolerances, which obviously involves production difficulties. The welds are a problem in themselves in that they easily invite corrosive attack and give rise to stresses when subjected to heat in a fire, said stresses reducing the fireproofness.

The reason for the rust formation is that use is made of unslushed sheet material, and that cleaning before paint spraying tends to leave moisture in the welds. Since spraying takes place after assembly (welding) of the safe body, and after the fire-resisting filling has been fitted, it is not possible to stove-enamel at temperatures above 100°C because water of crystallisation will then be released in the filling, e.g. the fireproofing resource will be prematurely called upon.

In conventional production, the safes must be sprayed directly after assembly and filling because otherwise corrosive action rapidly sets in. This means that one must decide already upon assembly which lock components are to be mounted in the door filling, and also that completely finished safes must be carried in stock, which naturally means an increase in cost.

The spraying of the finished safe bodies is a very difficult problem. Paint spraying inside a safe involves uncomfortable and hazardous working postures. The paint tends to fly back upon the painter, and spray painting therefore requires specially equipped paint shops.

The front of a conventional safe door is made in one piece with which the inwardly folded sheet material sections forming the door frame are integrated. I have found that a construction of this type causes difficulties when subjected to heat in a fire. The heating of the large front plate generates considerable strain due to thermal expansion which may easily rupture the filling and the frame sections, thereby impairing the fireproofness.

35

Object of the Invention

The object of this invention is to provide an improved safe of the type mentioned by way of introduction, whereby production and stock-keeping is simplified and rendered less costly, simultaneously as the fireproofness is improved or at any rate not impaired, in that the above-mentioned difficulties are essentially eliminated.

Summary of the Invention

The above object is achieved in that the safe according to the invention has the distinctive features stated in the appended claims.

The safe according to the invention thus is essentially characterised in that the sheet material section pertaining to the respective wall members of the outer body casing and forming an associated safe opening frame member is made in one piece with the wall member in question in the form of an inwardly folded sheet section member; that the sheet material section pertaining to the respective door edge and forming an adjoining door front member is made in one piece with an adjoining door front sheet member in the form of an inwardly folded sheet section member; and that the fillings are dimensionally stable also when subjected to intense heat. The said door front sheet members preferably are edge members which, in respect of thermal stress, are at least substantially detached from the remaining door front covering. The sheet material employed preferably is thin, with a typical thickness of from about 0.5 to about 2.5 mm. Thus, the casing sheets primarily serve as a mould for the fire-resisting filling during the moulding thereof.

The stable shape of the moulded filling, the thin, "pure" sheet material enclosure, and the absence of any sheet material joints (which means that dangerous temperature differences in the sheet material surfaces are eliminated) in the sheet material surfaces essential to the fireproofness, all contribute to making the sheet material surfaces highly extendible without deformation or

rupture of the filling within, in the event of a fire. At the sealing engagement surface between the door frame and the safe opening frame, there is even obtained an increased sealing effect due to the thermal expansion of the sheet material sections, simultaneously as no appreciable expansion of the dimensionally stable fillings occurs when subjected to heat.

All in all, these circumstances imply that the resulting fireproofness is exceptionally good.

From the viewpoint of production, several essential advantages are obtained. Thus, paint spraying can be carried out before assembly and before the fire-resisting fillings are fitted. After welding of the outer body casing, including the door opening frame integrated therewith and embracing the latch bolt holes and guides, and also the hinge pins, if any, the casing can be sprayed fully automatically in a conventional paint shop without any difficulties whatsoever. This applies also to the inner body casing, unless this is manufactured of ready-painted sheet material. Since the inner body casing merely serves as an inner mould and as an aesthetic wall surface for the inner space of the safe, it need not be welded together, but may be assembled by, for example, blind-riveting. Also the connection to the safe opening frame, preparatory to the moulding of the fire-resisting filling, can be carried out in a simple manner, for example by blind-riveting. Besides, I wish to point out that the term "sheet material", in connection with the inner body casing, is to be widely interpreted and comprises not only metallic sheet.

Also the door frame can be welded together and sprayed in the same manner before the fire-resisting door filling is moulded in position. The other sheet members, such as the door front plate, the inner door covering member and the safe back plate (these are in and per se not necessary, but are normally provided for aesthetic reasons), can be provided from ready-sprayed sheet material

and mounted after the fillings have been moulded, as will be described below. Also in this case, the sheet material need not be conventional metallic sheet, and other materials are of course conceivable.

5 Another highly essential advantage is that a safe according to the invention can be stocked in the unassembled state, and the ready-sprayed components need not be assembled (without welding), and the fillings moulded, until the safe is to be delivered. In connection with the
10 moulding of the door filling, locks of the type specified by the customer are mounted.

The sheet material section forming a safe opening frame member comprises, advantageously, a front member defining the safe opening and lying preferably in the
15 plane of the opening, and a connecting intermediate member extending generally rearwardly and forming the primary sealing engagement member, as well as a rear member connecting to the intermediate member and extending generally rearwardly. To this rear member, the inner body casing is
20 fixed. The sheet material section forming an upright frame member advantageously has a front member which issues directly from the side wall member of the outer body casing, and an intermediate member comprising a first member extending obliquely inwardly towards the centre of the
25 safe, and preferably a connecting second member extending inwardly towards the centre of the opening, especially parallel to said front member. The front member of each sheet section forming respectively an upper and a lower horizontal frame member, preferably connects with the top
30 wall member and the bottom wall member, respectively, of the outer body casing via a forwardly and outwardly bent transition member comprising a member projecting preferably at least essentially horizontally from said front member. The sheet sections of the door frame comprise, on
35 the one hand, front members and intermediate members corresponding to the front and intermediate members of the sheet sections of the door opening frame and, on the other

hand, connecting members between the respective door front sheet member and the associated front members. These connecting members correspond at their top and bottom to the said projecting members of the transition members of the safe opening frame. At the sides, these connecting members preferably are aligned with the side wall members of the outer body casing.

This preferred embodiment implies that the door hinge means can advantageously be fitted at the top and bottom of the safe opening frame in the space defined by said outwardly bent transition member and accommodating the filling, and in the adjoining door member. The safe can preferably be provided with hinge means on both sides of the door opening. The otherwise symmetrical construction makes it possible to fit the safe either with a right-hand or a left-hand door. The only other measure to be taken is a corresponding positioning of the hinge pins.

In a preferred embodiment, the front members of the door form a circumferentially extending narrow edge sheet, the inner part of which is folded back inwardly to define a countersunk area adapted to accommodate a door front panel or covering, for example a veneered wooden panel, whereby it is possible to conveniently adapt the door front to the individual customer's specifications regarding material, colour, etc.

Summing up, the new safe construction, in which the safe opening frame is integrated with the outer body, and with a detached door frame adapted thereto, implies that latch bolts and hinge pins directly engage, via the door frame, with the outer body which thus can be manufactured in advance. This gives a higher precision of construction and a simpler assembly, and makes it possible to use far simpler materials for the rest of the construction.

Brief Description of the Drawings

Fig. 1 is a schematic perspective exploded view of an embodiment of a safe according to the invention, shown

without the fire-resisting filling and without the front panel and inner covering panel of the door.

Fig. 2 is a schematic partial vertical longitudinal section of the upper part of the safe according to the invention, said upper part being designed symmetrically with the corresponding lower part of the safe.

Fig. 3 is a schematic partial horizontal longitudinal section of one side member of the safe according to the invention, said side member being symmetrical with the corresponding opposite side member of the safe.

Fig. 4 is a schematic partial vertical perspective section illustrating how the upper part of the door frame connects with the corresponding upper part of the safe opening frame, and the construction of the respective frame members, the fire-resisting filling being partly removed for better clarity.

Fig. 5 is a schematic partial horizontal perspective view illustrating how one side member of the door frame connects with the corresponding side member of the safe opening frame, and the construction of the respective frame parts. Also here the fire-resisting filling has been partly removed for better clarity.

Fig. 6 is a schematic partial vertical section substantially in accordance with Fig. 4, which illustrates the arrangement of the latch bolts and associated guides in the horizontal members of the door frame and the safe opening frame, respectively. Also the position of the door hinge is indicated.

Fig. 7 is a schematic partial horizontal section substantially in accordance with Fig. 5, which illustrates the arrangement of the latch bolts and the associated guides in the vertical members of the door frame and the safe opening frame, respectively. Also here the door hinge is shown.

Description of the Embodiment

The embodiment illustrated in Figs. 1-7 of a safe according to the invention comprises the following main components: an outer body casing 1 of sheet material, including two parallel opposite vertical outer side wall members 3, 4 and an upper horizontal outer top wall member 5 and, parallel thereto, a lower horizontal outer bottom wall member 6; a safe opening frame 7 surrounding a safe opening 8 positioned in a vertical plane and including two opposite vertical safe opening frame members 9, 10 and two opposite horizontal safe opening frame members 11, 12 (an upper member 11 and a lower member 12); an inner body casing 13 of sheet material, including two parallel opposite vertical inner side wall members 15, 16, a vertical inner rear wall member 17, and an upper horizontal inner top wall member 18 and, parallel thereto, a horizontal inner bottom wall member 19; a vertical rear member 21 connectible to the outer body casing 1 and parallel to the inner rear wall member 17; a door frame 23 including two parallel opposite vertical door frame members 25, as well as a horizontal upper door frame member 27 and an opposite horizontal lower door frame member 28; a door front panel 29; an inner door cover panel 30, a body filling 31; and a door filling 33.

The safe opening frame members 9, 10, 11, 12 are in the form of sectional elements integrated, i.e. made in one piece with the associated wall members 3, 4, 5 and 6, respectively, of the outer body casing. The frame members 9, 10 and also the frame members 11, 12 are symmetrical. The wall members 3-6 and the frame members 9-12 are welded together at their points of connection to form an uninterrupted unit which can then be conveniently surface-finished as desired.

Each of the upright frame members 9, 10 comprises a front member 41 projecting inwardly at right angles from the associated wall members 3 and 4, respectively, and defining, and lying in the plane of, the safe opening 8.

An intermediate member 42 forms an extension of the front member and extends first obliquely inwardly and rearwardly 42a and then inwardly 42b, parallel to the member 41. From the intermediate member issues a terminal extension
5 in the form of a rear member 43 which extends straight to the rear parallel to the safe side walls and forms an attachment for the inner body casing.

Each of the horizontal frame members 11, 12 comprises a front member 51 corresponding to and lying in
10 the same plane as the above-mentioned members 41, a connecting intermediate member 52 extending horizontally straight to the rear, and a terminal rear member 53 which is a direct extension of the intermediate member 52 in the plane thereof. The transition between members 52 and
15 53 lies in the plane of the members 42b.

The intermediate members 42 and 52 are the actual sealing and engagement members for cooperation with the corresponding members of the door frame.

The said forward members 51 are connected to the
20 associated top and bottom wall members 4 and 5, respectively, via a forwardly and outwardly bent transition member 54 which comprises a horizontally and forwardly projecting member 55, a vertically upwardly and downwardly, respectively, extending member 56, and an
25 obliquely rearwardly and upwardly/downwardly extending member 57. The transition member 54 projects in such a manner that the associated member 56 lies in a plane which also contains the frame front surface of the safe door.

30 The inner body casing 13 incorporates a U-shaped sheet providing the two inner side wall members 15, 16 and the inner rearward wall member 17. The wall members 16, 17 are formed at their front end with perpendicularly outwardly bent edge flanges 61, 62 which are utilised for
35 connection with the frame section members of the outer body casing 1, as will be explained below. The inner top wall member 18 and the inner bottom wall member 19 are

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formed of rectangular sheets with circumferential perpendicularly outwardly bent (i.e. upwardly and downwardly, respectively) edge flanges 63 and 64, respectively. It will be appreciated that these members can be readily
5 attached to the U-shaped sheet 15-17, for example by riveting of the edge flanges to the internal edge members of the sheet 15-17.

The inner body casing is introduced into the finished outer body casing from the rear, such that the wall
10 members 15, 16, 18, 19 are aligned and connect with the safe opening frame members 43 (one side), 43 (the other side), 53 (at the top) and 53 (at the bottom). The two casings are fastened together by means of separate angled fasteners 65, 66 and riveting. Thus, the fasteners 65
15 connect the inner side wall members 15, 16 with the frame members 43, and the fasteners 66 connect the inner top and bottom wall members with the frame members 53. It will be appreciated that the inner body casing and the fasteners can be ready-sprayed, and otherwise made ready
20 for assembly.

The four section frame members 25-28 of the door frame 23 are welded together to form a separate unit unconnected with large metal plates or surfaces generating stresses when subjected to heat. The upright frame
25 members 25, 26 have a rear member 71 and an intermediate member 72a, 72b entirely corresponding to the front member 41 and the intermediate member 42a, 42b of the safe opening frame. From the intermediate member 72b, a terminal rear member 73 projects inwardly as a direct extension and parallel to the plane of the safe opening. The
30 rear member 73 forms an attachment for an inner door cover panel 30 which preferably is nonmetallic.

From the outer edge of the rear member 71, a side member 75 projects forwardly in the plane of the outer
35 side walls 3, 4 of the safe body in the same manner as the projecting member 55 of the safe opening frame. Then, a forward member 76 extends a short distance at right

angles inwardly and parallel to the plane of the safe opening to form an edge surface member defining the door front, followed by a member 77 which extends straight to the rear, and a terminal member 78 which extends perpendicularly inwardly. Members 76, 77 and 78 are short to prevent harmful thermal stress when subjected to heat.

The horizontal frame members 27, 28 of the door frame have a rear member 81, an intermediate member 82, and a forwardly projecting member 85 entirely corresponding to the members 51, 52 and 55, respectively, of the safe opening frame. From the intermediate member 82, a terminal rear member 83 projects at right angles inwardly in the same plane as the members 73. The member 83 serves the same purpose as the member 73. From the leading edge of the projecting member 85, members 86, 87, 88 are extending, entirely in agreement with members 76, 77, 78 as previously described.

Members 76, 77 and 86, 87 define a hollow in the door front to accommodate a suitable door front panel 29 which preferably is exchangeable, for example by means of double-adhesive tape. A suitable door front panel is a veneered wooden panel.

It will be appreciated that the door frame 23 can readily be surface-finished as a unit, without any connection with the panels 29, 30 which can be surface-finished separately.

The door is fitted with a lock mechanism of conventional type. The mechanism comprises four circumferentially distributed latch bolts 91 with bolt drivers 93 (Figs. 6 and 7) in guides 95. The latch bolts 91 are associated with corresponding well-defined apertures 97, 98 in the intermediate member of the door frame sections and the sections of the safe opening frame, respectively. On the inside of the respective bolt apertures 98 in the safe opening frame members, there is a bolt cup 99 shielding the bolt from the body filling 31.

Door hinge means 101 are provided in each of the four corner areas of the horizontal frame members 27, 28 of the door frame 23, and at corresponding points in the transition members 54, as will appear from Figs. 1, 6 and 7. At each such point, a sleeve 103 is vertically mounted both in the door frame and in the safe opening frame. The hinge function is provided on the desired side simply by positioning a spring-loaded hinge pin 105 at the top and at the bottom in the associated sleeves 103. It will be appreciated that the sleeves 103 can be fixed in a highly well-defined manner in the corresponding frame member and in the filling within.

On completion of the safe, the surface-finished safe body is stood on its safe opening side, whereupon the fire-resisting filling 31 can be readily poured from the rear side of the safe into the free space formed between the outer and the inner body casing, the rear wall member 17 standing so far below the rear edges of the side wall members 3 and 4 that the rear wall filling will obtain the required thickness. After moulding of the filling, the rear wall member 21, which merely need have a decorative function, is fitted in some suitable manner.

The safe door is completed by placing the surface-finished door frame in a horizontal mould, preferably with the front facing downwardly, whereupon the door filling 33 is moulded. After the moulding has set, the decorative covering panels 29, 30 are mounted at a convenient time.

30

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CLAIMS

1. A fire-resisting safe comprising a box-shaped
5 safe body with a safe opening, said body including a safe
opening frame which is formed of sections of sheet mate-
rial and to which an outer and an inner body casing, also
of sheet material, are connected, the space formed
between said inner and said outer body casing and defined
10 at the front by the safe opening frame being filled with
a fire-resisting filling; and a safe door hung in the
safe body and including a door frame which also is formed
of sheet material sections and which laterally defines a
door inner space also filled with a fire-resisting fill-
15 ing, said door frame conforming to the safe opening
frame, such that, when the safe door is closed, the door
frame and the safe opening frame all round sealingly
engage one another along at least a part of the cross-
section of the respective steel material section,
20 c h a r a c t e r i s e d in that that the sheet mate-
rial section pertaining to the respective wall members of
the outer body casing and forming an associated safe
opening frame member is made in one piece with the wall
member in question in the form of an inwardly folded
25 sheet section member; that the sheet material section
pertaining to the respective door edge and forming an
adjoining door frame member is made in one piece with an
adjoining door front sheet member in the form of an
inwardly folded sheet section member; and that the fill-
30 ings are dimensionally stable also when subjected to
intense heat.

2. Safe as claimed in claim 1, c h a r a c t e r -
i s e d in that the said door front sheet members are
edge members which, in respect of thermal stress, are at
35. least substantially detached from the remaining door
front covering.

3. Safe as claimed in claim 1 or 2, c h a r a c -
t e r i s e d in that the respective sheet sections
forming a safe opening frame member comprise a front mem-
ber defining the safe opening and lying preferably in the
5 plane of the opening, and a connecting intermediate member
extending generally rearwardly and forming a sealing
engagement member, as well as a rear member connecting to
said intermediate member and extending generally rear-
wardly, the inner body casing being fixed to said rear
10 member.

4. Safe as claimed in claim 1, c h a r a c t e r -
i s e d in that the respective sheet material sections
forming an upright frame member have an intermediate mem-
ber comprising a first member extending obliquely inward-
15 ly towards the centre of the safe, and preferably a con-
necting second member extending inwardly towards the
centre of the opening, especially parallel to said front
member; and in that the front member of the respective
sheet sections forming respectively an upper and a lower
20 horizontal frame member, connects with the top wall mem-
ber and the bottom wall member, respectively, of the
outer body casing via a forwardly and outwardly bent
transition member comprising a member projecting prefer-
ably at least essentially horizontally from said front
25 member.

5. Safe as claimed in claim 4, c h a r a c t e r -
i s e d in that the sheet sections of the door frame
comprise, on the one hand, front and intermediate members
corresponding to the front and intermediate members of
30 the sheet sections of the door opening frame and, on the
other hand, connecting members between the respective
door front sheet member and the associated front members,
said connecting members corresponding at the top and
bottom to the said projecting members of the transition
35 members of the safe opening frame, and preferably being
aligned at the sides with the side wall members of the
outer body casing.

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6. Safe as claimed in claim 5, characterised in that door hinge means are fitted at the top and bottom of the safe opening frame in the space defined by said outwardly bent transition member and accommodating the filling, and in the adjoining door member.

7. Safe as claimed in any one of the preceding claims, characterised in that the door front members form a circumferentially extending edge sheet which, at its inner edge, is folded back to define a countersunk area adapted to accommodate a door front panel or covering.

8. Safe as claimed in any one of the preceding claims, characterised in that the filling in the safe body and the safe door is moulded concrete.

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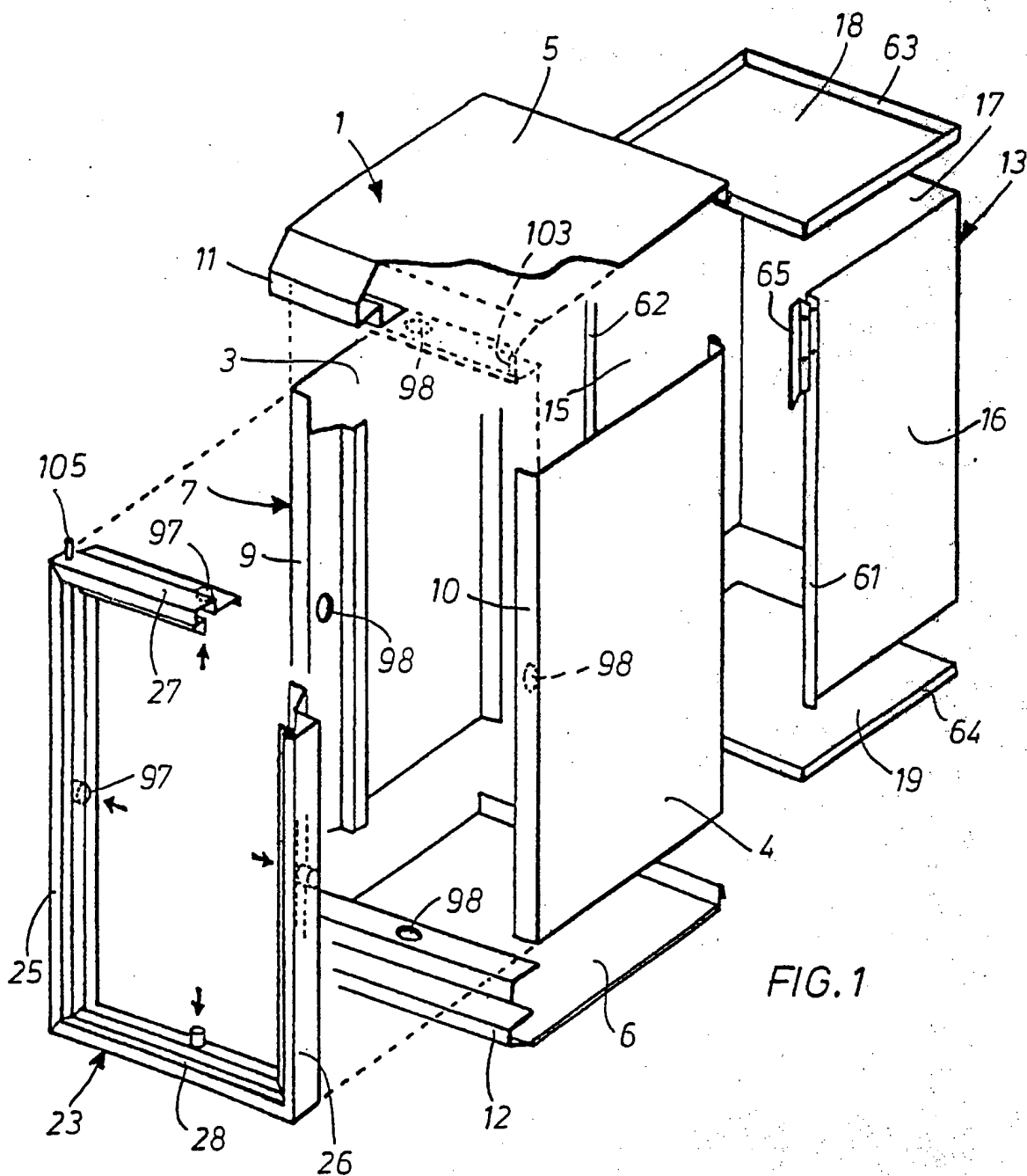
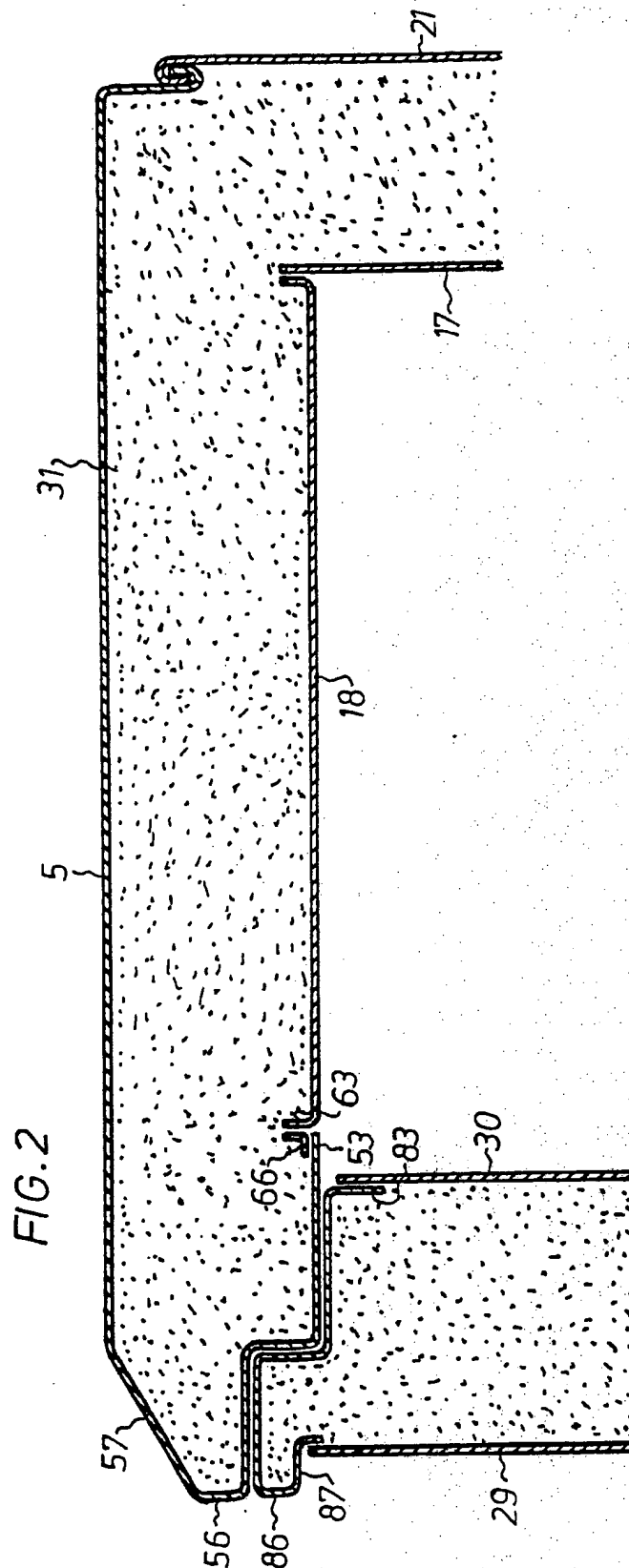


FIG. 1

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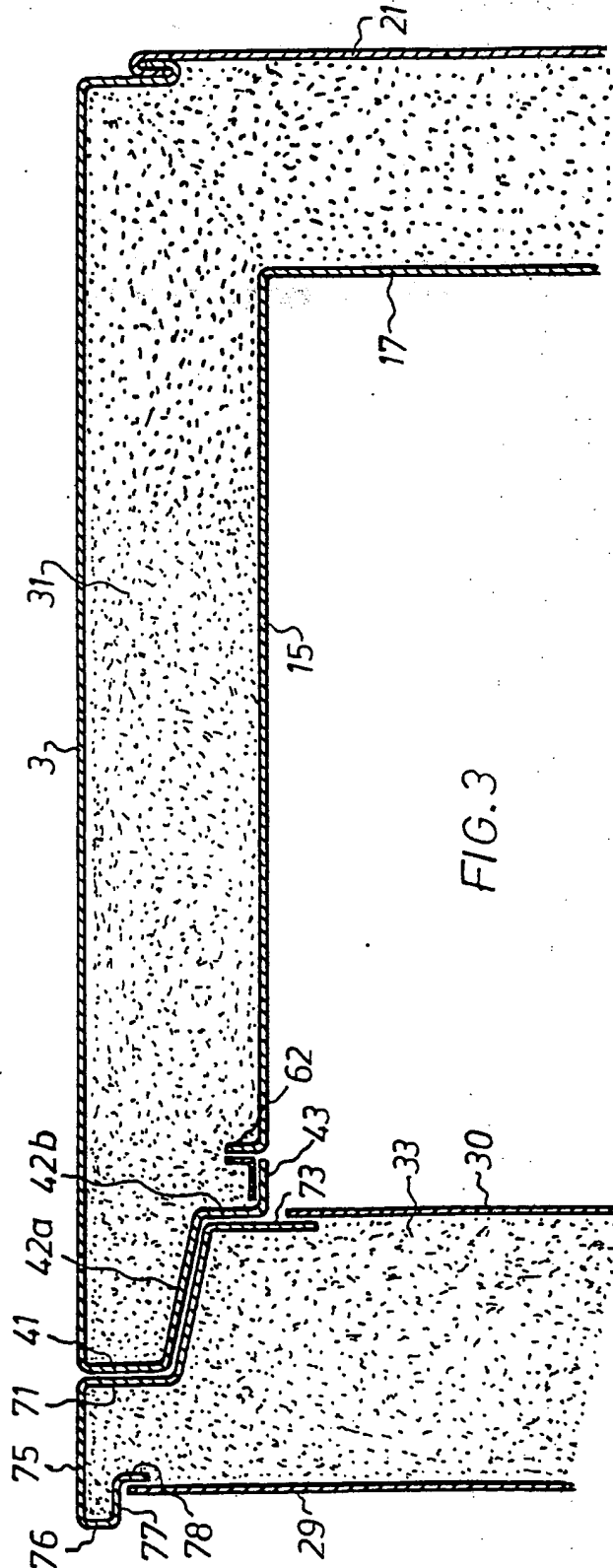
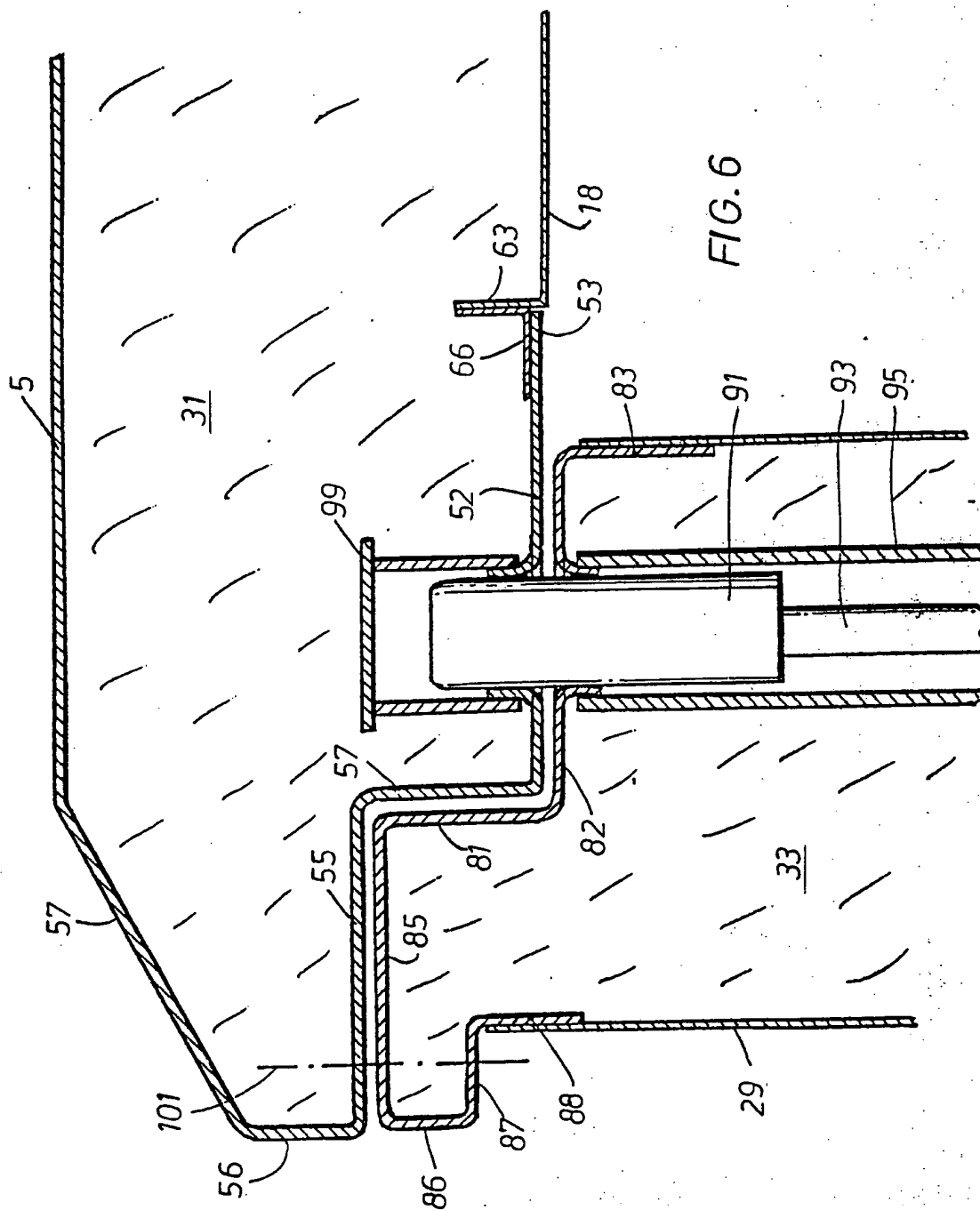


FIG. 3

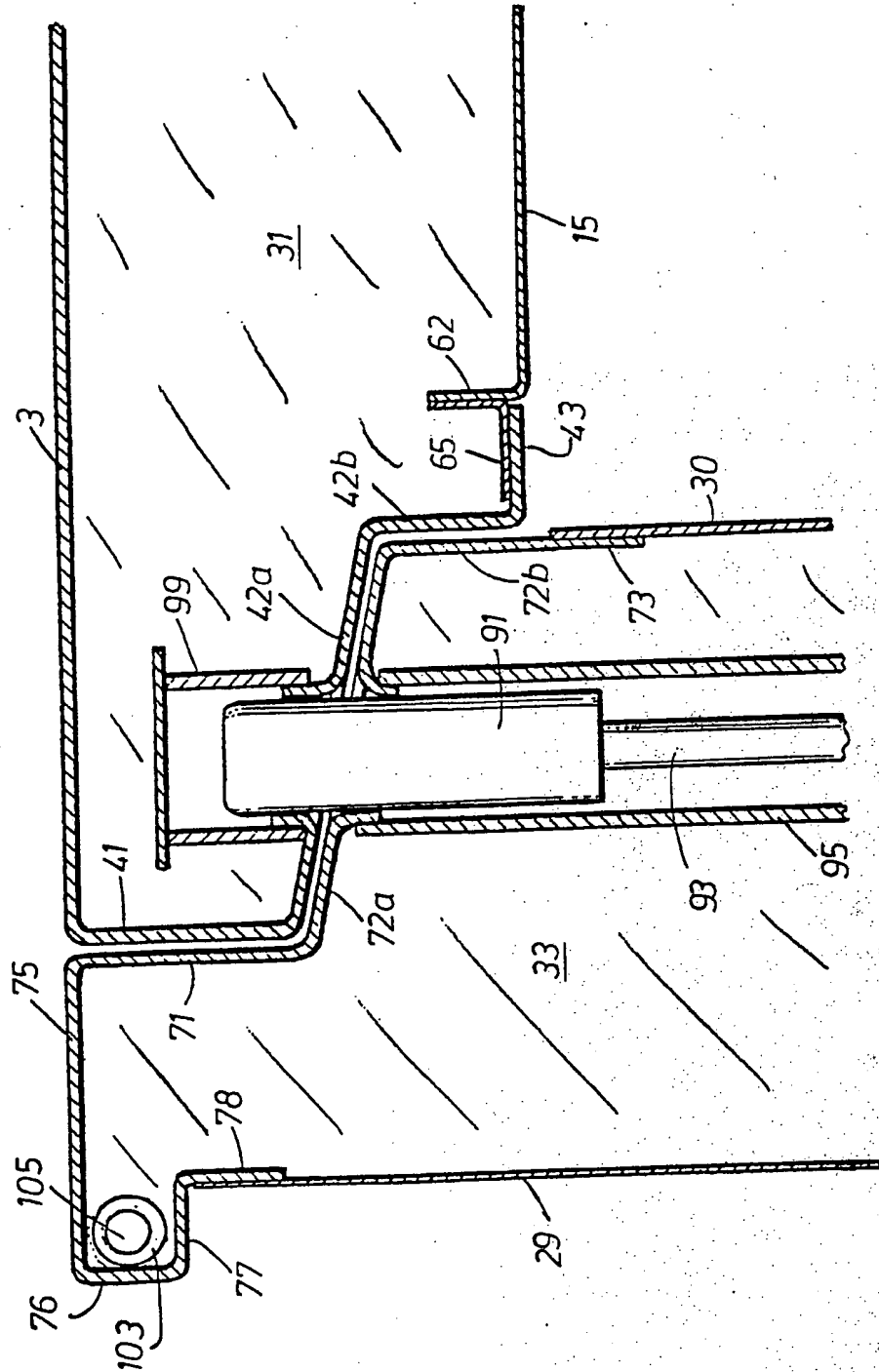
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SUBSTITUTE SHEET

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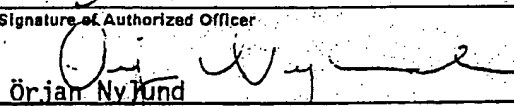
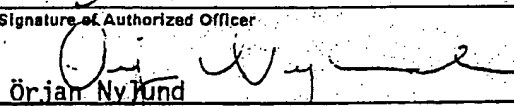
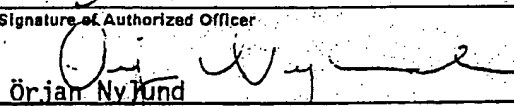
FIG. 7



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INTERNATIONAL SEARCH REPORT

International Application No. PCT/SE 90/00645

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ⁶ According to International Patent Classification (IPC) or to both National Classification and IPC IPC5: E 05 G 1/024, A 47 B 47/02, 55/04																				
II. FIELDS SEARCHED <div style="text-align: center; border-top: 1px solid black; border-bottom: 1px solid black;">Minimum Documentation Searched⁷</div> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%; border-bottom: 1px solid black; padding: 2px;">Classification System</td> <td style="border-bottom: 1px solid black; padding: 2px;">Classification Symbols</td> </tr> <tr> <td style="padding: 5px;">IPC5</td> <td style="padding: 5px;">E 05 G; A 47 B</td> </tr> </table> <div style="text-align: center; border-top: 1px solid black; border-bottom: 1px solid black;">Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in Fields Searched⁸</div> <p style="padding: 5px;">SE,DK,FI,NO classes as above</p>			Classification System	Classification Symbols	IPC5	E 05 G; A 47 B														
Classification System	Classification Symbols																			
IPC5	E 05 G; A 47 B																			
III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹ <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%; padding: 2px;">Category *</th> <th style="width: 60%; padding: 2px;">Citation of Document,¹¹ with indication, where appropriate, of the relevant passages¹²</th> <th style="width: 30%; padding: 2px;">Relevant to Claim No.¹³</th> </tr> </thead> <tbody> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">Y</td> <td style="padding: 5px;">US, A, 1464213 (A. MOSLER ET AL) 7 August 1923, see page 1, line 73 - line 80; figure 2 --</td> <td style="text-align: center; vertical-align: top; padding: 5px;">1</td> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">X</td> <td style="padding: 5px;">US, A, 3408966 (W.J. GARTNER) 5 November 1968, see details 18, 26 --</td> <td style="text-align: center; vertical-align: top; padding: 5px;">1</td> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">Y</td> <td style="padding: 5px;">--</td> <td style="text-align: center; vertical-align: top; padding: 5px;">1</td> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">X</td> <td style="padding: 5px;">US, A, 3826552 (ANDERSON) 30 July 1974, see column 2, line 15 - line 21; figure 1 --</td> <td style="text-align: center; vertical-align: top; padding: 5px;">1</td> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">A</td> <td style="padding: 5px;">US, A, 3762787 (GRUBB) 2 October 1973, see the whole document --</td> <td style="text-align: center; vertical-align: top; padding: 5px;">1-8</td> </tr> </tbody> </table>			Category *	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³	Y	US, A, 1464213 (A. MOSLER ET AL) 7 August 1923, see page 1, line 73 - line 80; figure 2 --	1	X	US, A, 3408966 (W.J. GARTNER) 5 November 1968, see details 18, 26 --	1	Y	--	1	X	US, A, 3826552 (ANDERSON) 30 July 1974, see column 2, line 15 - line 21; figure 1 --	1	A	US, A, 3762787 (GRUBB) 2 October 1973, see the whole document --	1-8
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<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>[*] Special categories of cited documents:¹⁰</p> <p>^{"A"} document defining the general state of the art which is not considered to be of particular relevance</p> <p>^{"E"} earlier document but published on or after the international filing date</p> <p>^{"L"} document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>^{"O"} document referring to an oral disclosure, use, exhibition or other means</p> <p>^{"P"} document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 45%;"> <p>^{"T"} later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>^{"X"} document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>^{"Y"} document of particular relevance, the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>^{"&"} document member of the same patent family</p> </div> </div>																				
IV. CERTIFICATION <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; border-bottom: 1px solid black; padding: 2px;">Date of the Actual Completion of the International Search</td> <td style="width: 50%; border-bottom: 1px solid black; padding: 2px;">Date of Mailing of this International Search Report</td> </tr> <tr> <td style="padding: 5px;">11th December 1990</td> <td style="padding: 5px;">1991 -01- 03</td> </tr> <tr> <td style="border-bottom: 1px solid black; padding: 2px;">International Searching Authority</td> <td style="border-bottom: 1px solid black; padding: 2px;">Signature of Authorized Officer</td> </tr> <tr> <td style="padding: 5px; text-align: center;">SWEDISH PATENT OFFICE</td> <td style="padding: 5px; text-align: center;">  Örjan Nylund </td> </tr> </table>			Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	11th December 1990	1991 -01- 03	International Searching Authority	Signature of Authorized Officer	SWEDISH PATENT OFFICE	 Örjan Nylund										
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III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
A	US, A, 4593627 (LANKARD ET AL) 10 June 1986, see the whole document --	8
A	DE, A1, 2931330 (DISTELRATH GMBH) 26 February 1981, see the whole document -- -----	1-8

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO. PCT/SE 90/00645

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the Swedish Patent Office EDP file on 90-11-01. The Swedish Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A- 1464213	23-08-07	NONE	
US-A- 3408966	68-11-05	NONE	
US-A- 3826552	74-07-30	CA-A- 983564	76-02-10
US-A- 3762787	73-10-02	AU-B- 466716	75-11-06
		AU-D- 4296072	73-12-06
		CA-A- 967217	75-05-06
		DE-A-B- 2245453	73-03-29
		FR-A- 2153886	73-05-04
		GB-A- 1353566	74-06-05
		GB-A- 1365741	74-09-04
US-A- 4593627	86-06-10	NONE	
DE-A1- 2931330	81-02-26	EP-A- 0023621	81-02-11